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Contents

General Articles :

Immunological Studies on *Dictyocaulus viviparus* Infection. Passive Immunisation ... 291
W. F. H. Jarrett, M.R.C.V.S.
F. W. Jennings, B.SC., M.AGR.
W. I. M. McIntyre, M.R.C.V.S.
W. Mulligan, M.SC., PH.D.
G. M. Urquhart, M.R.C.V.S.

A Transmission Experiment with Neurolymphomatosis 297
R. F. Gordon, D.SC., M.R.C.V.S.
R. Coles, M.SC., B.A., M.A. (AGRIC.), PH.D.
C. G. Stacey

The Rearing of an African Elephant in Captivity 301
J. I. Taylor, B.SC., PH.D., M.R.C.V.S.

Current Literature :

Report : . 303
Annual Report of the Department of Veterinary Services Animal Industry of Nyasaland for 1955

Book Reviews 303

Abstracts 304

News and Comment : ... 305

Correspondence :

Snow-shoes for Horses 307
P. K. Hall-Patch, B.SC., M.R.C.V.S.

Pregnancy Toxaemia 307
H. B. Parry, B.A., M.R.C.V.S.
Stewart Macfarlane

Scheme for Animal Nurses ... 309
G. R. Benbow, M.R.C.V.S.

The Register of Veterinary Surgeons 309
R. I. Macrae, M.R.C.V.S.
George Dykes, M.R.C.V.S.

Vis Used-to-be Fortior 310
Tom Hare, M.D., B.V.SC., M.R.C.V.S.

Immunological Studies on *Dictyocaulus viviparus* Infection. Passive Immunisation

BY

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Introduction

ATTEMPTS at passive immunisation in helminth infections have produced variable results. Significant reductions in the numbers of parasites developing from a challenging infection in passively immunised animals as compared with non-immunised controls have been reported in *Cysticercus fasciolaris* infections of rats (Miller, 1934; Campbell, 1938) in *Cysticercus pisiformis* infections of rabbits (Kerr, 1935), in *Nippostrongylus* infections in rats (Sarles & Taliaferro, 1936; 1938) and *Strongyloides* infections of rats (Lawlor, 1940). Relatively less successful results have been obtained in ancylostome infections of dogs (Otto, 1938) and mice (Kerr, 1938), in schistosome infections of mice (Stirewalt & Evans, 1953) and in filariasis of cotton rats (McFadzean, 1953).

While there is no published information on the effects of passive immunisation against *D. viviparus* infections of bovines, there is evidence that a strong acquired immunity exists in the field (Taylor, 1951; Wetzel, 1948; Gregoire, 1951), and this is supported by our own observations in the field and on experimental reinfections of recovered field cases of parasitic bronchitis.

The present communication is a report of some experiments on the passive immunisation of young calves against *D. viviparus*, using serum obtained from recovered field cases after they had been subjected to experimental reinfections.

Methods and Materials

Serology

Complement fixing antibodies associated with *D. viviparus* infection can be detected in the serum using a "boiled" antigen prepared from adult parasites by the method of Stewart (1950). In our immunological studies on lungworm infection we are using a quantitative complement fixation test similar to that described by Maltaner and his colleagues (for references see Kabat & Mayer, 1948). The method depends upon measuring the amount of

complement required to give 50 per cent. haemolysis in the presence of immune serum plus antigen (IS+A) and that required to give 50 per cent. haemolysis in the presence of immune serum alone (IS). The quotient $\frac{IS+A}{IS}$ is used to measure the potency of the serum. Details of the application of this test to *D. viviparus* infection in bovines will be the subject of a separate communication.

Complement fixation tests were carried out by the above method on the sera of the immunised calves to confirm that absorption of the intraperitoneally injected globulins was taking place, and to follow the level of the passively transferred antibody during the course of the experiment.

Immune Serum

Immune serum was obtained from six recovered field cases of the disease whose antibody titre had been boosted by experimental reinfection with doses ranging from 50,000 to 200,000 infective larvae of *D. viviparus*. All these animals showed a typical "secondary response," the level of complement-fixing antibody reaching a maximum two to four weeks after the experimental infection. These six animals showed almost complete resistance to reinfection, *viz.* in only one case did respiratory symptoms occur, and larvae did not appear in the faeces of any of the animals up to five months after reinfection. When the level of complement fixing antibodies in the serum was approximately at its maximum, the animals were each bled twice, with a three-day interval between bleedings. The blood was allowed to clot, the serum drawn off, centrifuged and pooled. A total of 23 litres of serum was obtained.

In order to reduce the volume and the amount of protein used in the passive immunisation, a globulin preparation was obtained by adding anhydrous Na_2SO_4 to a final concentration of 18 per cent. No attempt was made to isolate further the antibody-containing globulin fractions in view of the lack of precise information on the distribution and location of helminth antibodies in bovine serum. The globulin precipitate was freed from sulphate by dialysis overnight against running tap water and then for 48 hours against a large volume of isotonic NaCl The final volume of this solution was 7.5 litres with a protein concentration of 10.8 g. per 100 ml.

Experimental Calves

Ten Ayrshire bull calves of less than a week old were purchased and maintained on a diet consisting of milk, hay, and concentrates. They were housed in individual metal pens and the bedding was changed twice weekly.

Immunisation and Infection

When 10 weeks old, each of five calves were injected intraperitoneally with 500 ml. of the immune globulin preparation daily on three consecutive days. Two days after the last injection each calf was infected with 4,000 *D. viviparus* larvae (7- to 10-day-old) by the method described by Jarrett, McIntyre, & Urquhart (1954). Five control calves were infected at the same time in the same manner. Blood samples were collected prior to immunisation and at intervals during the experimental period. The calves were killed and autopsied 30 days after infection, the lungs removed, the gross lesions noted, and pieces of lung selected for histological examination.

The bronchi were opened, the worms collected and counted, and those from each calf dried in a separate petri dish over P_2O_5 in a vacuum desiccator. Samples of bronchial mucus were examined microscopically and the lungs were minced and examined for lungworms by the Baerman technique.

Histological Techniques

Several blocks of tissue were taken from each pulmonary lobe, both consolidated and apparently normal pieces being selected. These were fixed in corrosive-formol, dehydrated in an alcohol-amylacetate series, cleared in chloroform and embedded in paraffin, all of these processes being carried out under reduced air pressure.

Results

A clinical examination of the 10 calves was carried out 14 days after infection and repeated every third day until the calves were killed. A difference between the immunised and the control groups was apparent on the 17th day and became progressively more marked with time. The individual respiratory rates are shown in Table I and the mean respiratory rates for both groups are shown in Fig. 1.

TABLE I
RESPIRATORY RATES OF IMMUNISED AND CONTROL CALVES

Days after infection		14	17	20	23	25	28
Respiratory rates of immunised group	1	45	50	40	70	70	70
	2	30	30	35	50	35	30
	3	30	50	50	50	45	45
	4	35	35	35	40	45	45
	5	35	35	50	65	60	60
	Mean	35	40	42	55	51	50
Respiratory rates of control group	6	40	60	70	80	80	80
	7	35	60	70	80	80	70
	8	40	60	70	80	100	110
	9	60	90	90	90	100	100
	10	50	60	60	60	65	65
	Mean	45	66	72	78	85	85

With the exception of calf 1 the immunised calves did not develop a severe clinical pneumonia at any time during the experiment. Auscultation revealed only a bronchovesicular inspiration without adventitious sounds. Although the respiratory rate of calf 1 reached 70 per minute, at no time did it become dyspnoeic.

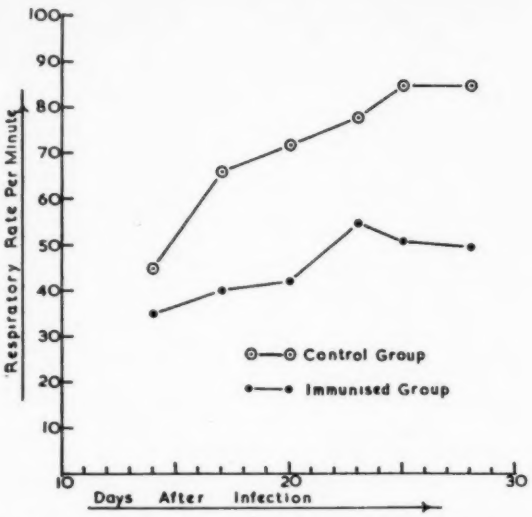

FIG. 1.—Mean respiratory rates of control and immunised groups.

All the controls, except calf 10, were very severely affected and were markedly dyspnoeic. Auscultation revealed a harsh bronchial inspiration and adventitious rhonchi were heard. Although the repiratory rate of calf 10 did not reach as high a level as the others, auscultation revealed a harsh bronchial inspiration in no way different from that of the other four control calves.

Larval counts on the faeces of the immunised and control animals were carried out on the 25th and 29th day after infection. The results are shown in Table II.

TABLE II

FAECAL LARVAL COUNTS OF IMMUNISED AND CONTROL CALVES

		25th day		29th day	
		McMaster (larvae/gm.)	Baerman	McMaster (larvae/gm.)	Baerman
Immunised group	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	+
	4	0	0	0	+
	5	0	0	0	0
Control group	6	200	—	650	—
	7	150	—	100	—
	8	300	—	250	—
	9	50	—	150	—
	10	500	—	900	—

The numbers of worms recovered from each of the autopsied calves are shown in Table III and illustrated in Fig. 2; the total weight of dried worms and the average dry matter per worm are also shown in Table III.

TABLE III

NUMBERS AND WEIGHTS OF LUNGWORMS RECOVERED FROM IMMUNISED AND CONTROL CALVES

	Calf Number	Number of worms	Total weight of dried worms (mg.)	Average D.M. per worm (mg.)
Immunised group	A*	60	—	—
	B*	0	—	—
	1	0	0	0
	2	0	0	0
	3	142	89·6	0·631
	4	49	16·2	0·331
	5	11	2·4	0·218
	Total	262	108·2	1·180
	Mean	37·4		0·536
Control group	C*	311	—	—
	D*	712	—	—
	6	1,224	906·6	0·741
	7	83	28·0	0·337
	8	1,131	890·6	0·787
	9	778	558·1	0·717
	10	1,262	1,362·8	1·080
	Total	5,501	3,746·1	3·662
	Mean	786		0·837

* These four calves constituted a pilot experiment carried out in essentially the same manner.

The average number of worms in the control groups was 786 as compared with 37.4 in the immunised group. There was also a reduction in the average weight per worm measured as dry matter in the latter group, although this may not be significant in view of the variation in the average weight per worm in each individual calf. In this connection it is interesting to note that there is a statistically significant correlation between the number of worms and the average weight per worm in each lung; in general a large number of worms is associated with a greater weight per worm. Examinations for immature worms in the bronchial mucus and in Baerman sediments of minced lung were negative in each case.

The results of the complement fixation tests on the control and immunised calves are shown in Fig. 3. It is evident that absorption of the intraperitoneally injected immune globulins occurred rapidly, resulting in a high titre at the time of infection. This titre fell normally during the course of the experiment and was still positive at its termination. The small increase in titre of the sera of the calves in the control group indicates some active production of antibody.

The numbers of worms present in the bronchi of the calves were found to parallel closely the degree of consolidation of the diaphragmatic lobes seen at autopsy (Table IV). The superficial lesions in the lungs of the control group were more extensive than those in the lungs of the immunised group as shown in Fig. 4. The larger size of the lungs of the control group was due to a fairly well marked interstitial emphysema. The consolidated areas were congested

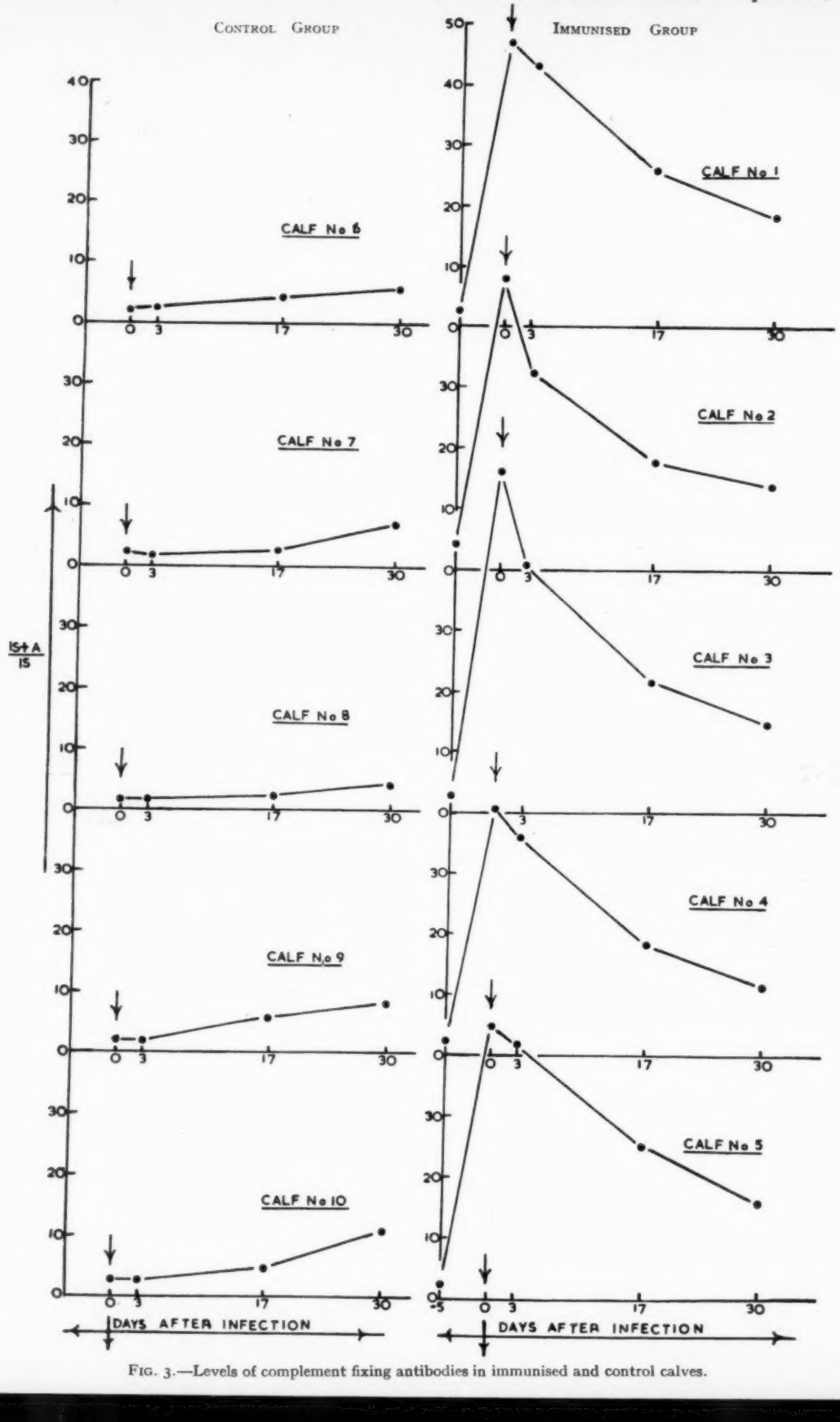

FIG. 3.—Levels of complement fixing antibodies in immunised and control calves.

TABLE IV

CORRELATION BETWEEN NUMBERS OF WORMS AND GROSS LESIONS IN THE LUNGS OF IMMUNISED AND CONTROL CALVES

	Calf	Number of worms	Diaphragmatic consolidation	Emphysema
Immunised group	1	0	—	—
	2	0	—	—
	3	142	++	—
	4	49	+	—
	5	11	trace	—
Control group	6	1,224	++++	+
	7	83	++++	+
	8	1,131	+++	+
	9	778	+++	+
	10	1,262	++++	+

and partially collapsed and on the surface they were depressed below the level of adjacent normal lobules. Friable hepatisation of the typical lobar or bronchopneumonic type was not a feature; this was due to the type of inflammatory response present (*vide infra*). The bronchi appeared normal and where worms were present, contained white frothy fluid. Pus was present in the bronchi of calf 7; this calf had the smallest number of worms of the control group. With the exception of two cases (calves 5 and 7) the pneumonic lesions in the immunised and control groups differed only in degree and not in type and were typical of those of 30-day experimental infections (to be published in detail elsewhere) and of many field cases (Jarrett *et al.*, 1954). Calves 1 and 2 did not show any gross lesions. The main lesions in the consolidated areas were complete or partial collapse of affected lobules, intense macrophage infiltration of the alveolar walls and lumina, larvated eggs and first stage larvae in the alveoli and the presence of foreign-body type giant-cells, many of which were attacking or engulfing eggs and larvae. In all except calves 1 and 2, there was a mild purulent bronchitis and bronchiolitis and in some this had advanced to the stage of mild purulent bronchopneumonia. Calves 5 and 7 showed severe diffuse alveolar epithelialisation (*vide* Jarrett *et al.*, 1954); in these two lungs, microscopical collapse was not a marked feature and therefore alveolar epithelialisation could be easily seen; it was present in a lesser degree in calves 6, 8, 9, and 10, but in these it was impossible to estimate the extent because of the alveolar collapse and the heavy macrophage infiltration into the walls and lumina of the alveoli. In these two calves (5 and 7) a peculiar lesion was found. Some bronchi contained dead adult lungworms and some of the former had lost their epithelium so that the worms were directly apposed to the bronchial mural structures, the latter being heavily infiltrated with plasma cells.

Discussion

It is generally recognised that animals which have recovered from an infection with *D. viviparus* manifest an increased resistance to reinfection (Wetzel, 1948; Gregoire, 1951). In experimental reinfection of a number of recovered field cases we confirmed this increased resistance to reinfection and have demonstrated that it is accompanied by a rise in the titre of complement fixing antibodies in the serum. It seemed desirable to investigate the protective action of this high titre serum by injecting it into young susceptible calves and subsequently challenging them by infection.

There is no doubt from the results obtained in this experiment that passive immunisation with serum of the titre and in the amounts used conferred a high degree of protection against infection. This is manifested by the relative absence of respiratory symptoms, the marked reduction in the extent of the gross lesions, and by the reduction in the number of lungworms developing from a challenging infection. The average respiratory rate of the control group was significantly higher than that of the immunised group and auscultation showed that the former had a greater degree of pulmonary affection.

At autopsy the degree of consolidation of the lungs paralleled, in most cases, the number of worms recovered from the bronchi; the two lungs which did not contain parasites were free from pneumonia caused by the nematodes although microscopical "cuffing" lesions from an earlier spontaneous infection were present; this might explain the increased respiratory rate in calf 1. In the control calves the extent of the lesions was typical of a 30-day 4,000 larvae infection, the greatest degree of consolidation being present around the main diaphragmatic bronchi where most of the worms were located, the true extent of damage being seen only when transverse sections of these lobes were made. The type of reaction, too, was characteristic of this stage, in that it consisted of a phagocytic response to the presence in the alveoli of first stage larvae and eggs. This exemplifies once more the fact that the severity of the syndrome is due in great part to the pneumonia accompanying the infestation and not only to the obstructive action of the worms. This makes it probable that a method, such as immunisation, of preventing the development of the alveolar lesions will probably be much more valuable than therapy aimed at killing the worms *in situ*.

One of the theoretical problems of immunisation against parasitic bronchitis was the possibility that an immune reaction might take place in the lungs, resulting in a cellular reaction which would enhance the pneumonic effects; under the conditions of this experiment, no such reaction occurred. The significance of the marked epithelialising of alveoli and necrosis of worms which occurred in one immunised (5) and one control (7) calf is at the moment unknown.

A common lesion in both field and experimental cases of parasitic bronchitis is interstitial emphysema and the latter is often responsible for a serious deterioration in respiratory function. It was present in all of the control and in none of the immunised calves.

In Table III are recorded the main results of the present experiment and to these have been added the numbers of worms recovered from four calves used in a pilot experiment. The total number of

worms recovered from the control group is 5,501 compared with 262 in the immunised group, corresponding to mean worm burdens of 786 and 37.4 respectively. In the immunised group the lungs of three of the calves contained no worms. The foregoing is clear evidence of the efficacy of passive immunisation as carried out under the conditions of these experiments.

Inhibition of development associated with the acquisition of specific resistance has been described by Taylor & Michel (Taylor, 1951, 1952; Taylor & Michel, 1953) in field and experimental studies on parasitic bronchitis. Under the conditions of our experiment in which both groups of calves were killed 30 days after infection, immature forms were not found in the bronchial mucus or in the minced lung and were not seen on histological examination. It is the case that the mean dry matter per worm in the immunised group was less than that in the control group (0.536 mg. as compared with 0.837 mg.) but examination of the values for the worms from individual calves suggests that this difference in weight is not associated with inhibition of development in the immunised group, but is related to the number of worms present; the more numerous the worms the larger the value for dry matter per worm. However, the total number of calves is too small to draw any general conclusions on the relationship of worm size to worm burden.

In this connection the result obtained from calf 3 is puzzling. The faeces of this calf contained no larvae on examination by both Baerman and McMaster techniques on the 25th day after infection. This might be due to lack of precision in the larval recovery techniques and/or to fluctuations in faecal larval outputs; yet in calf 7 which contained only 83 worms, larval counts of 150 larvae per gramme were obtained on the same day. That the worms in calf 3 were not inhibited in size at the 30th day is shown by their dry matter weight (Table III) and by reference to Fig. 2. While it might be surmised that the absence of demonstrable larvae in the faeces on the 25th day indicated a specific inhibition of sexual development, examination of the worms at autopsy showed that they were fully mature, their uteri containing larvated eggs; furthermore histological sections of the lungs of this calf revealed the presence of aspirated eggs and first stage larvae in the alveoli. Two other explanations for our failure to recover larvae from the faeces of calf 3 when compared with calf 7 are the possible destruction in calf 3 of the first stage larvae during their passage along the bronchi or gut, or alternatively the loss of a considerable number of worms in calf 7 between the 25th and 30th day.

The main conclusions which emerge from this experiment are: in parasitic bronchitis there are humoral antibodies which are detectable and measurable by a complement fixation test, and the serum containing these antibodies confers a considerable degree of protection against a single challenging infection of infective larvae of *D. viviparus* in calves which have not been previously infected. These findings offer some hope that a practical method of immunisation against *D. viviparus* might be devised.

Summary

1. Circulating antibodies associated with *D. viviparus* infections can be detected by means of a complement fixation test.

2. Hyperimmune serum was obtained by experimental infection of recovered field cases of parasitic bronchitis.

3. A globulin preparation from this serum when injected intraperitoneally into calves conferred a considerable degree of immunity to infection.

Acknowledgment.—This work was supported by a grant from the Agricultural Research Council.

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AILMENTS OF BIRDS, RABBITS, GOLDFISH, ETC.

There appears to be an increasing demand for veterinary assistance in dealing with the ailments of less usual domestic pets such as birds, rabbits, goldfish, etc. It would be helpful if readers who are interested, or who have specialised knowledge, would kindly notify the General Secretary, British Veterinary Association, 7, Mansfield Street, Portland Place, London, W.1, and at the same time state whether they would be prepared to give advice on specific problems to veterinary surgeons who may require their assistance.

A list of names will then be kept at B.V.A. headquarters, and those wishing for advice are invited to apply to the Association.

JARRETT, W. F. H., JENNINGS, F. W., McINTYRE, W. I. M., MULLIGAN, W., & URQUHART, G. M.—IMMUNOLOGICAL STUDIES ON *DICTYOCAULUS VIVIPARUS* INFECTION. PASSIVE IMMUNISATION.

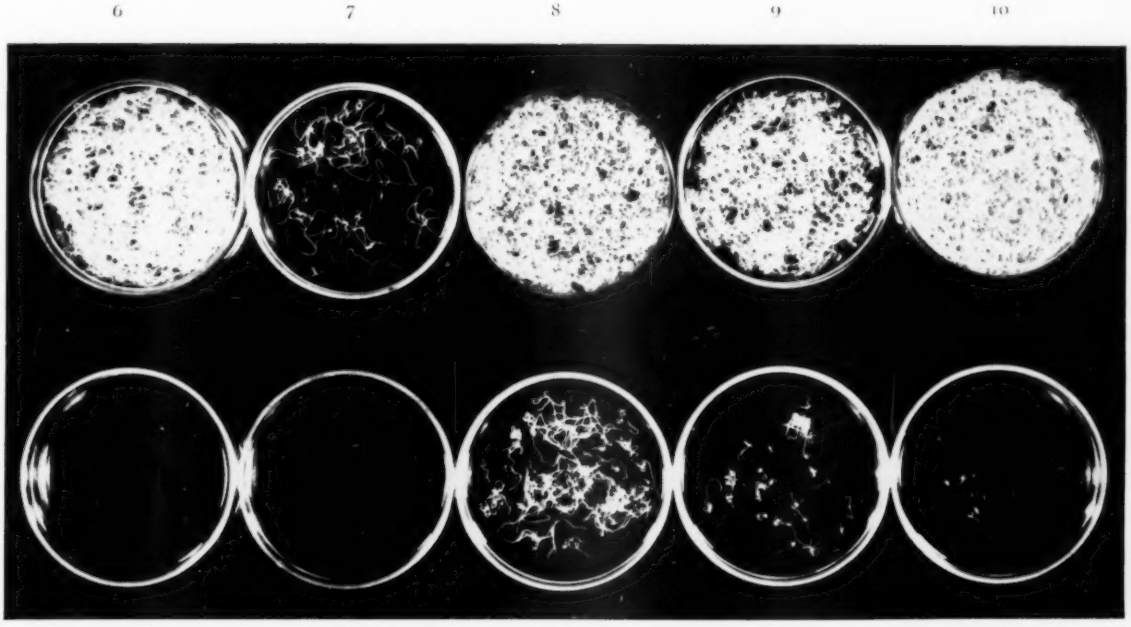

FIG. 2.—Lungworms obtained from passively immunised and control calves.

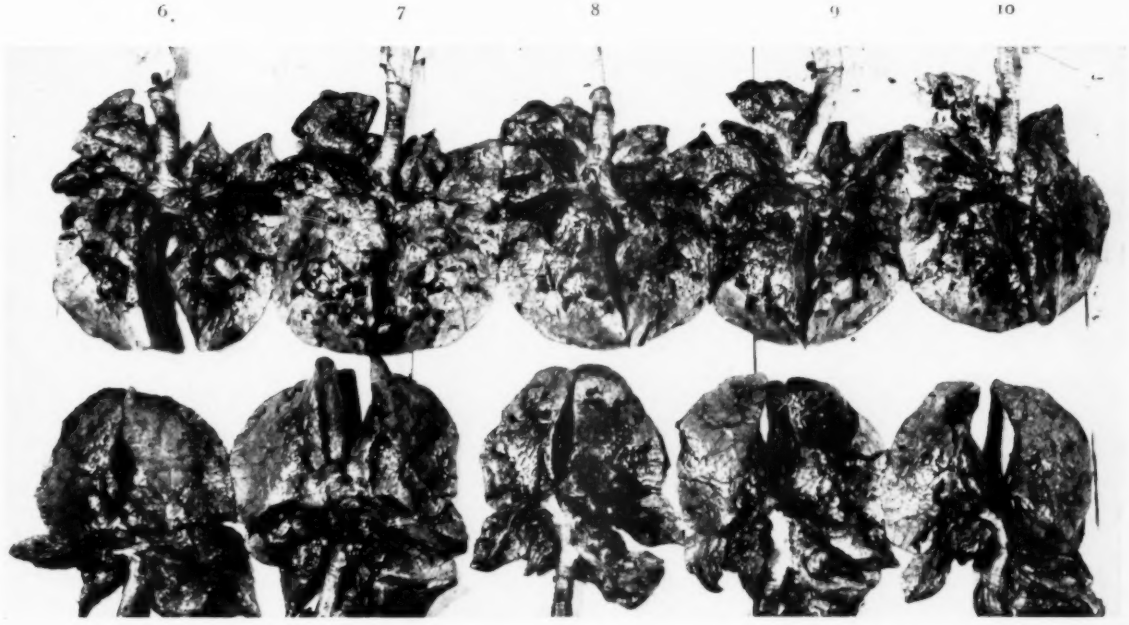

FIG. 4.—Lungs from immunised and control calves.

A Transmission Experiment with Neurolymphomatosis

BY

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Introduction

UNTIL recently one of the most confusing aspects of the so-called "Avian Leucosis Complex" has been the conflicting views held by different workers on the mode of transmission of the disease, particularly the part played by transmission via the egg. The East Lansing workers (Waters & Prickett, 1944; Waters, 1944, 1947; Waters & Bywaters, 1949; Cottral *et al.*, 1949, 1954) have incriminated the egg as a means of transmitting lymphomatosis, while the reports from Cornell (Hutt & Cole, 1947; Cole, 1949; Cole & Hutt, 1951, 1954) suggest that egg transmission, if it does occur, is of negligible importance compared with the effect of exposure during the critical period after hatching.

Recent reports by Waters (1954) and Campbell (1954) have gone far to clarify the position and to reconcile these conflicting views. Waters (1954) presents data to justify the belief that the four types referred to as avian lymphomatosis, viz., visceral, neural, ocular and osteopetrotic represent four distinct disease entities and are caused by four distinct and different agents. Campbell (1954) separates the visceral from these other forms and terms it lymphoid leucosis. He suggests that neurolymphomatosis (fowl paralysis) is a chronic inflammatory condition outside the leucotic complex and characterised by nerve infiltrations and occasional lymphogranulomatous "tumours." Osteopetrosis he regards as completely unlike any of the leucoses and separate from fowl paralysis, whilst the ocular form he considers should, for the time being, remain *sub judice*.

Cottral *et al.* (1954) have provided evidence that the agent causing visceral lymphomatosis is present in embryonated eggs and in the tissues of the newly hatched chick, and that apparently healthy hens can harbour the agent and transmit it through their eggs, although the relative importance of egg transmission has not yet been settled. Experimental proof that neurolymphomatosis can be transmitted by the egg is lacking, but there is a widely held view that the disease can be spread by diseased or carrier fowls to freshly introduced young susceptible birds.

Waters (1954) states that the opposing views on egg transmission held by these two groups of workers are resolved if each has been working with a different disease entity for if, as it appears, the major portion of the mortality found by Cole & Hutt was neurolymphomatosis, while the East Lansing studies were carried out with the visceral form, then the conclusion might be changed to read that "little evidence could be found for the theory of egg transmission of neurolymphomatosis."

Whatever the final conclusions may be as to the part played by egg transmission in the spread of avian leucosis, the majority of workers are agreed that infection during the first few weeks of life is essential for a high incidence of both leucosis and neurolymphomatosis and that delaying the exposure of chicks until after they are a month old has consistently resulted in a reduced incidence of the disease (Hutt *et al.*, 1944; Hutt & Cole, 1953; Waters & Bywaters, 1949). It has been suggested (Burmester & Gentry, 1954) that the causal agent of "visceral lymphomatosis" is present in the secretion of the oral and nasal cavities and in the excretions from the intestinal and urinary tracts of both diseased and healthy birds.

The present experiment was designed prior to these publications and in the hope of throwing some further light on this vexed question of such fundamental importance to all distributors of poultry stock. Although the results are by no means conclusive they appear to be worthy of publication in the light of these subsequent reports.

Method and Materials

Two closed inbred flocks were selected for this test. Flock A, situated in Oxfordshire, consisting of White Leghorns, was first established in 1946, and from the dates of hatching until the August of the year following, approximately 18 months each season, no culling has been undertaken and all birds dying or slaughtered *in extremis* have been examined *post mortem* at the Poultry Research Station. Neurolymphomatosis first made its appearance in 1948-49 at a low level of 1.5 per cent. and increased to attain a level of 14.7 per cent. in 1950-51. Although breeding for resistance was carried out the pedigree section of the flock still had an incidence of neurolymphomatosis of 8.6 per cent. in 1951-52, while unselected susceptible lines from which the experimental material originated had a lymphomatosis mortality in 1952-53 of over 17 per cent. (Coles, 1954). Table I shows the incidence of leucosis and neurolymphomatosis in the flock from day old to 12 months of age each year. Although leucosis has also been diagnosed in this flock, neurolymphomatosis has predominated at a level of 87 per cent. of the total mortality from these two causes (Gordon, 1953).

Flock B, consisting of Barred Plymouth Rocks and Brown Leghorns, was started in 1948 as the control flock of the Poultry Research Station, Huntingdonshire. This flock has also had a history of leucosis from which a mortality rate ranging from 0.5 per cent. in the Brown Leghorns to 11.0 per cent. in the Barred Rocks has occurred. In contradistinction to Flock A, leucosis has occurred in over 90 per cent. of instances (Gordon, 1953). In fact, only 10 cases of neurolymphomatosis have occurred during the last five years; five in 1949 and five in 1950 (Table I). The families in which these cases

*Ministry of Agriculture.

TABLE I

TOTAL MORTALITY AND INCIDENCE OF LEUCOSIS AND NEUROLYMPHOMATOSIS FROM 0 TO 12 MONTHS OF AGE IN FLOCKS A AND B 1948–52

Year	Flock A. Oxford				Flock B. Poultry Research Station, Huntingdonshire							
	White Leghorns				Brown Leghorns				Barred Rocks			
	Number started	Per cent. mortality	Per cent. leucosis	Per cent. neuro-lympho-matosis	Number started	Per cent. mortality	Per cent. leucosis	Per cent. neuro-lympho-matosis	Number started	Per cent. mortality	Per cent. leucosis	Per cent. neuro-lympho-matosis
1949	775	12·3	0·2	1·5	708	6·5	1·1	Nil	1,330	13·9	2·6	0·3
1950	718	29·7	2·2	14·6	413	13·6	0·7	0·2	863	18·3	2·4	0·5
1951	1,174	24·2	1·6	14·7	298	12·7	1·1	Nil	728	22·3	6·9	Nil
1952	926	18·8	1·1	8·6	275	16·9	1·1	Nil	653	41·2	11·3	Nil

occurred were not used for breeding and since 1950 no cases of neurolymphomatosis have been encountered in this flock until after the present experiment started.

It was thought that if transmission during the early brooding period took place, then evidence of neurolymphomatosis should appear among chicks of Flock B which had been hatched and brooded in contact with Flock A chicks, while the incidence of leucosis might be expected to show a relative increase in the Flock A chicks hatched and reared at Station B in contact with chicks from that station. Conversely, if groups of chicks from the two flocks were incubated and reared separately for four weeks, then no such marked alteration in the relative incidence of the two forms of the complex within the flocks should occur when compared with the incidence in siblings retained on their home premises. The occurrence of neurolymphomatosis in chicks from Flock A incubated, hatched and reared on Flock B premises, where this form of the disease did not exist at the time, might be considered as some evidence for egg transmission of neurolymphomatosis. With this end in view, the experiment was designed in three parts. Early in March, 1953, 300 eggs were brought from Flock A and incubated in a forced-draught machine with 300 eggs, a random sample, from all the Barred Rock breeding pens of Flock B. The 169 pullet chicks hatched from these eggs were reared together in four wire-floor brooders until eight weeks of age when they were transferred to a deep litter house as one flock. This flock is referred to as groups A1 (Flock A eggs) and B1 (Flock B eggs). Four weeks later 123 four-week-old chicks incubated and reared on Flock A premises were brought to the Poultry Research Station and reared in two wire-floored brooders. At the same time, 129 chicks of the same age from Flock B were reared separately in a similar manner. When eight weeks of age the pullets of these two groups (designated A2 & B2) were also placed in the deep litter house with groups A1 and B1. A third group (B3) consisting of 240 first cross pullets (Brown Leghorn ♂ and Barred Rock ♀) from Flock B were again reared separately and when seven weeks of age placed in the same deep litter house but separated from groups A1, B1, A2 and B2 by a wire netting partition. The controls were the normal flock replacements of Flocks A and B incubated, reared and maintained throughout on their home premises with no direct contact with any of the experimental groups.

The details of the groups involved are shown in Table II. There is no direct contact between premises A and B which are 80 miles distant.

TABLE II

Group number	Origin	Incubated	Reared	Housed
A1	W.L., Flock A, Oxford	At P.R.S., with Group B1 eggs	Mixed with group B1 chicks from day old	In deep litter unit in contact with Groups B1, A2 and B2
A2	W.L., Flock A	At Flock A premises, Oxford	For four weeks at Flock A and then for further four weeks at P.R.S., but separate from Flock B chicks	From eight weeks in deep litter unit with Groups A1, B1 and B2
A3	W.L., Flock A	Normal Flock A replacement incubated at Flock A premises, Oxford	At Flock A premises, Oxford	At Flock A premises, Oxford
B1	B.R., Flock B, P.R.S., Huntingdon	At P.R.S., with Group A1 eggs	Mixed with Group A1 chicks from day old	In deep litter unit in contact with Groups A1, A2 and B2
B2	B.R., Flock B	At P.R.S., but separately from Groups A1 and B1	For eight weeks at P.R.S., but in separate units from other groups	As above with Groups A1, B1 and A2
B3	First crosses, Flock B	At P.R.S., but separately from Groups A1, B1 and B2	For eight weeks at P.R.S., but in separate units from other groups	In half of deep litter unit separate from Groups A1, B1, A2 and B2, netting division
B4	B.R., Flock B	Normal Flock B replacement incubated separately from above groups	At P.R.S., but separate from all above groups	At P.R.S., but separate from all above groups
B5	Br.L., Flock B	As for Group B4	As for Group B4	As for Group B4

Groups A1, B1, A2 and B2 remained together in the deep litter unit until February, 1954, when the birds were approximately 12 months of age. Groups B1 and B2 were disposed of at this stage, but groups A1 and A2 were retained for a further four months. Group B3 was removed to a laying cage battery unit when the birds were 16 weeks of age. At no time was there any direct contact between the groups in the deep litter unit (A1, B1, A2, B2 and B3) and the control groups B4 and B5. All dead birds or birds killed *in extremis* were examined *post mortem* at the Poultry Research Station and the results are shown in Table III and graphically in Fig. 1. *(overleaf)*.

were again no cases in the Brown Leghorn replacement flock, but only one case of neurolymphomatosis has ever been encountered in this flock, viz., in 1950.

The numbers involved are probably too small for any inference to be drawn as to the reasons for the varying incidence of the disease within the groups. It could be argued, however, that it was associated with different levels of susceptibility, the cross breds being more susceptible than the Barred Rocks for not only did they show a higher incidence than the Barred Rocks of groups B1 and B2, but there was less exposure to Flock A chicks. Based on the results of groups B4 and B5 the Barred Rocks appeared to

TABLE III

MORTALITY OF BIRDS UNDER TEST

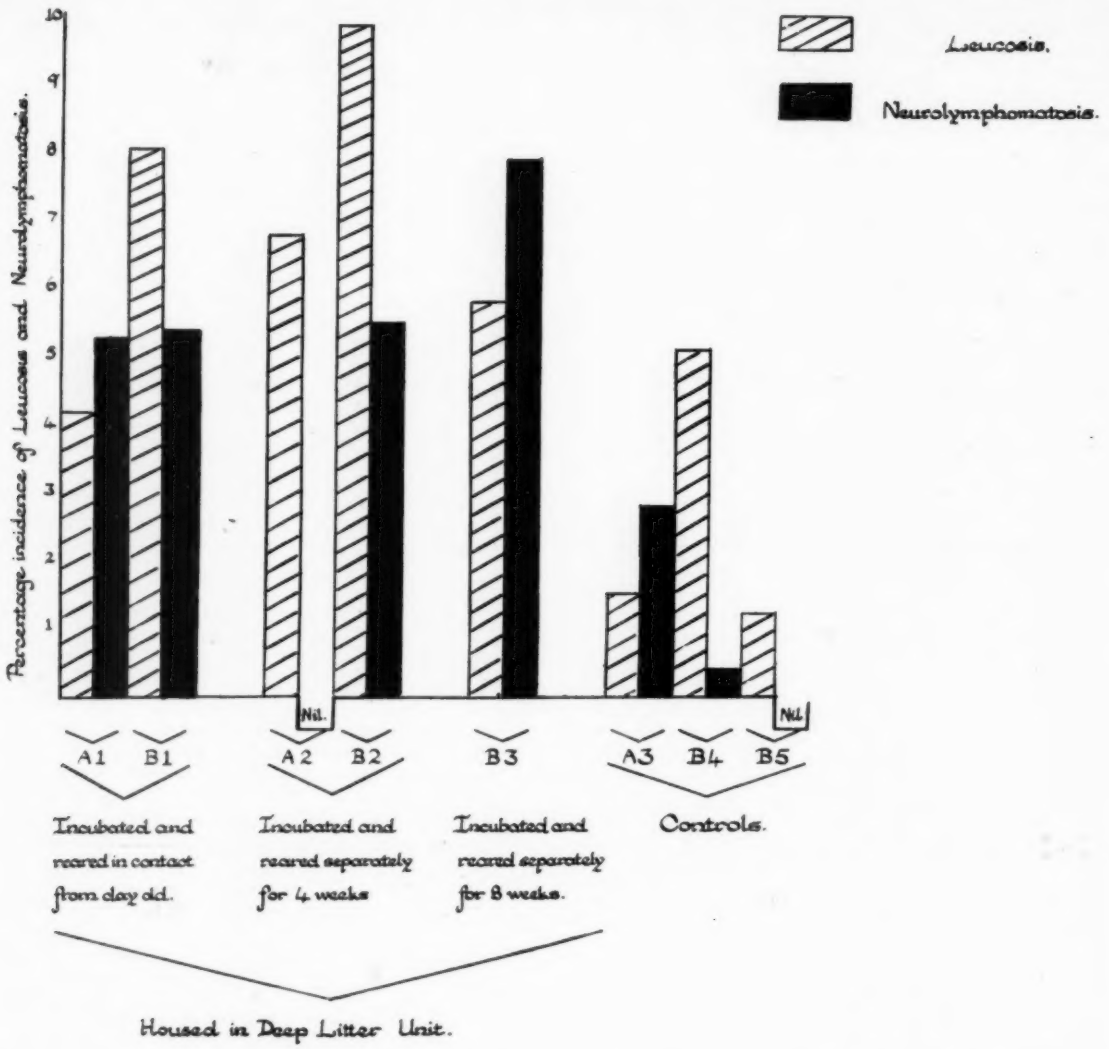
From eight weeks old to June 30th, 1954, for Group Nos. A1, A2 and B3
From eight weeks old to February 28th, 1954, for Group Nos. B1 and B2
From day old to February 28th, 1954, for Group Nos. B4 and B5

Cause of death	Group A1		Group A2		Group A3		Group B1		Group B2		Group B3		Group B4		Group B5	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Neurolymphomatosis	5	5·3	Nil	Nil	15	2·8	4	5·4	5	5·5	19	7·9	3	0·4	Nil	Nil
Visceral lymphomatosis ...	4	4·2	5	6·8	8	1·5	6	8·1	9	9·9	14	5·8	35	5·1	4	1·2
Other causes ...	22	23·2	14	19·2	43	8·2	23	31·1	38	41·8	28	11·7	179	25·8	112	32·3
Total deaths ...	31	32·6	19	26·0	66	12·5	33	44·6	52	57·1	61	25·4	217	31·3	116	33·5
No. started ...	95		73		525		74		91		240		693		346	

Discussion

It will be noted that neurolymphomatosis occurred for the first time for three years in all groups of Flock B birds with the exception of the Brown Leghorn replacements which had no direct contact with the birds from Flock A. It would appear safe to assume that infection was introduced by the birds from Flock A and it is of interest to note that the incidence was equally great in groups B1 and B2 (5.4 and 5.5 per cent); that is irrespective of whether direct contact was from the incubator onwards or only after eight weeks. Admittedly, there was opportunity for indirect contact between group B2 and Flock A chicks of group A1 which were on the same premises from day old. The same fact holds good for group B3 chicks in which a higher incidence of the disease occurred (7.9 per cent.) and in which there was again no direct contact until the chicks were eight weeks of age. This contact was only for eight weeks when this group (B3) was moved at 16 weeks to a battery cage and it was while in the cages that all the cases occurred. Infection may also have been transmitted indirectly to the Barred Rock replacements of Flock B (group B4) in which there had been no direct contact with Flock A, although they were reared on the same premises and attended by the same staff, but the occurrence of the disease was not significantly different from that during previous years. The incidence at 0.4 per cent. (three cases in 693 chicks reared) was much lower than in the direct contact (B1 and B2) and indirect contact (B3) groups, but similar to that during 1949, 1950 and 1951. There be slightly more susceptible than the Brown Leghorns, in which no cases occurred, since both groups had equal exposure to Flock A chicks. This relative difference in susceptibilty has been observed since the establishment of the flocks.

It appears possible that infection from Flock A originated via the egg, for a 5 per cent. level of infection of neurolymphomatosis occurred in group A1 brought to the Poultry Research Station as eggs. It is, of course, possible that infection was brought by the group A2 chicks of Flock A which had been reared on their own infected premises for four weeks, but if so, they must have been symptomless carriers as no evidence of the disease was found in this group over a 400 day period. Obviously, the isolation of Flock A chicks (group A1) at premises where the disease was not thought to exist (based on the previous three years' records) was not successful in completely suppressing infection. While, conversely, the chicks of group A2 reared in contact for four weeks with their siblings, in which the disease occurred, did not show clinical neurolymphomatosis. An explanation of this latter result is difficult to find unless it is sheer chance, since this group contained fewer chicks than A1, but only one chick less than B1 in which four cases occurred. It does not appear to support the theory of early brooding exposure influencing the incidence of infection. The same fact holds good with regard to group B1 which although directly exposed from day old had no higher an incidence of the disease than group B2 and a lower incidence than group B3, both of which were only



exposed to Flock A chicks in the deep litter unit from eight weeks of age. Conversely, group B4 which were siblings of groups B1 and B2 had a much lower incidence of infection and one can only assume that this was related to the lower degree of exposure, for group B4 had no direct contact with Flock A chicks throughout.

There does appear to have been some transference of leucosis from Flock B to Flock A for the incidence of that disease increased in Flock A chicks compared with that of previous years or with that in the replacements chicks (group A3) reared on Flock A premises.

Summary and Conclusions

The controversy concerning the mode of transmission of the avian leucosis complex is briefly reviewed, and attention directed to the conclusions of some workers that, while there is evidence to support belief in the transmission of "visceral lymphomatosis" or leucosis via the egg, such evidence is lacking with regard to neurolymphomatosis. Two flocks (A and B), situated at centres 80 miles apart and under the supervision of the authors, have manifested in recent years mainly leucosis at one centre (B) and very largely neurolymphomatosis at the other (A). In the hope of investigating the mode of transmission of neurolymphomatosis, eggs and, four weeks later, four-week-old chicks, were brought from centre A to centre B. The eggs were hatched at centre B, together with a sample of eggs from Flock B, and all the chicks so hatched were reared and housed together in a deep litter house. The four-week-old chicks brought in from Flock A were reared separately, but not in isolation, and were then housed together with a further group of Flock B birds (which had not been incubated with Flock A eggs) in the

deep litter house already mentioned. Other groups of birds from Flock B were reared in units varying in proximity to the experimental birds.

No bird from the group of chicks brought in from Flock A at four weeks died from neurolymphomatosis over a period of 400 days; but both groups from Flock A—those hatched at Station B and "imported"—manifested an incidence of leucosis, substantially above the proportion found in Flock A at its home centre. The authors cannot offer any explanation for the curious behaviour of the "imported" birds from Flock A. It seems probable, however, that neurolymphomatosis manifested in Flock B birds was introduced by the Flock A birds; and it seems reasonable to argue that the disease may have been introduced via the egg, for the four-week-old chicks from Flock A did not show any evidence of the disease although it could be contended that they were carriers without themselves manifesting the disease. Moreover, the curious behaviour of the four-week-old chicks from Flock A offers little support to the theory that exposure during the early brooding period influences incidence of infection from the disease. This view obtains further confirmaton from the results of the Flock B chicks in that the two experimental lots had a similar level of mortality from neurolymphomatosis, although one group was in contact with Flock A chicks from day-old stage and the second group only from eight weeks old.

The remaining groups of Flock B birds showed varying levels of mortality from neurolymphomatosis, apparently related to the degree of proximity to the Flock A birds and of susceptibility to the disease.

Acknowledgment.—The authors wish to thank Mr. F. Cumber of the A.G.C. Experimental Farm, Oxford (Flock A) for his generous co-operation in this experiment.

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The Rearing of an African Elephant in Captivity

BY

J. I. TAYLOR

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FROM time to time the veterinarian is faced with the problem of giving advice regarding the rearing of wild animals which have been captured. Generally the information required is scanty or is published in rather inaccessible literature. Practical experiences, therefore, are worth recording. There is given below the description of the rearing of a young elephant, with which we were able to assist by the courtesy of the Game Warden, Uganda.

Elephants had been raiding gardens and were driven away by a Game Guard who had to shoot an elephant cow in the long grass. It was then found that she had a small male calf. He was crated and sent by lorry to Entebbe, a journey of about 180 miles. The young elephant weighed some 150 lb. and was about two weeks old.

It was thought that the food requirements of the calf would be approximately 20 pints of milk per day. As will be discussed later, in the literature available there appeared to be wide variations in the analyses of elephant's milk, but in order to have some basis upon which to work it was considered that 20 pints of elephant's milk would supply proteins 13·6 oz., lactose 25·6 oz., and fats 28·8 oz. The same quantity of local cow's milk would supply proteins 13·2 oz., lactose 19·6 oz., and fats 14·4 oz. Clearly, then, the principal deficiencies were in lactose and fats. In order to fortify the cow's milk, 1·8 oz. protein, 12 oz. lactose and 5 oz. cream were added to each 20 pints. The protein was given as calcium caseinate, containing approximately 90 per cent. protein. It will be observed that the protein and lactose are now in excess but the fat is still low. This was purposely so, as it was considered that excess fat might cause digestive troubles. The animal, also, had severe scouring which stopped when the lactose was increased.

The milk was fed in pint quantities spread over the 24-hour period. In addition, the calf received two teaspoonfuls of blackcurrant juice, two yeast tablets and 1 oz. cod-liver oil daily. At first tomato juice was given instead of blackcurrant juice but this was bulky and appeared to be too acid. Small quantities of boiled water were offered but the young elephant did not seem to relish this.

The elephant settled down quickly and seemed very attached to his attendant. He took exercise readily and enjoyed playing in a shallow pool which was dug for him and was particularly fond of being sprayed with a watering can.

At the end of a week (when he was about three weeks old) he was thriving and weighed 175 lb. and measured 33 inches at shoulder height. The feeding and constant care became very expensive and at this stage he was flown over to Nairobi to a zoological society collector. This change in environment had unfortunate effects and the animal died shortly afterwards of gastro-enteritis.

COMPOSITION OF ELEPHANTS' MILK

Author		Total solids	Fat	Protein	Lactose	Ash	Breed
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Devocht	1	33·31	22·07	3·21	7·39	0·65	African
"	2	30·71	19·09	3·09	7·26	0·63	"
Anselmi and Calo ...		—	6·6	3·2	5·4	0·7	Asian
Crudi	3	—	6·7	3·4	6·4	0·4	"
Kranze and Legatowa	4	—	13·2	4·3	3·85	0·93	"
Nottbohm	5	26·85	15·12	4·89	3·39	0·76	"

1. Maximum constituents. 2. Minimum constituents. 3. Recommended composition. 4. Sixth month of lactation. 5. Eleventh month of lactation.

Discussion

In order to be able to rear a new-born animal artificially it is essential to have some idea of the composition of the mother's milk, yet from the accompanying table it will be seen that there is wide variation reported between the constituents of elephants' milk. Probably Kranze & Legatowa (1949) have the correct answer when they remark that there are wide differences in composition depending upon the stage of lactation.

Crudi (1951), reporting upon the rearing of an Asiatic elephant, states that the colostrum of elephants is almost devoid of fat, but is rich in protein, carbohydrate and minerals. From previous experience he concluded that young elephants are intolerant of the fat of cow's milk, a fact which we can confirm with regard to the African elephant. Fat should be increased with care and note taken of any tendency to scour. Should the fat be 5 per cent. or below, however, it is not wise to decrease it ; instead the lactose should be increased. Excess of protein may also cause scouring, and Crudi (1951) suggests that this is effected by the protein creating an alkaline medium in the intestines and so making an interaction between the fatty acids and mineral salts with a resultant saponification.

Markuze (1939) states that in comparison with cow's milk, elephant's milk is low in vitamin A (less than 1 I.U. per ml.) and it is low in vitamin D, but that the vitamin B_1 content is higher than that of cow's milk (25 I.U. per 100 ml.) compared to 10 I.U. per 100 ml. He also states that the vitamin B_1 complex content is found to be approximately equal in cow's or elephant's milk, but elephant's milk has a higher ascorbic acid content.

Opinions agree as to the quantity of milk required. Crudi (1951) found that during the first week of life the elephant consumed 8 litres (14 pints) of milk daily and this increased gradually until by the eighth week the elephant was taking 14 litres (24·5 pints) per day. Our figures bear this out in that during the third week of the elephant's life we aimed at feeding 20 pints, but only succeeded in getting it to take about 17 pints. Oberjohann (1953), who raised an African elephant, recommends feeding 18 pints per day of milk mixture for the first two or three weeks but is very emphatic that young elephants should not be nursed during the day. He recommends that the first feed should be at 7 p.m. and then at intervals throughout the night until 6 a.m. No other observers appear to have made this point, but all are agreed that in the early stages the quantity should not exceed 1 quart at one feed.

It was our experience that water was not taken readily, and Oberjohann (1953) reports that he was never able to get the elephant to drink water by bottle. He solved his particular difficulty by standing the elephant in the water of Lake Chad almost up to mouth level. He observed that about 6 to 7 quarts of water were taken daily by mouth, but not by trunk. Devocht (1950) considers that regular bathing is necessary and Ferrier (1947) gives details of this and many other useful points of management for the Indian elephant.

It will be realised that it is no mean task to rear an elephant to maturity by artificial means. Not the least of the undertaking is the heavy expense and constant labour involved. There are few records of it having been achieved with African elephants but it has its reward, however, in the rapid growth and lively intelligence of the animal.

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INTERNATIONAL CONGRESS OF COMPARATIVE PATHOLOGY

Under the presidency of Professor Fluckiger, director of the Federal Veterinary Office, the Seventh International Congress of Comparative Pathology will be held in Lausanne from May 26th to 31st. A number of papers will be read (details are not to hand) and discussions will follow. There will be a full social programme in addition to the sessions.

Full details may be obtained from the General Secretariat, 19, Rue César Roux, Lausanne.

Current Literature

REPORT

Annual Report of the Department of Veterinary Services Animal Industry of Nyasaland for 1955.

The Nyasaland Government has largely accepted the policy and plans of the Department for the development of the livestock industry and has agreed to the recruitment of the necessary staff. Although some staff vacancies still exist, the department can already record valuable and encouraging progress.

Through the efforts of the Senior Veterinary Research Officer, the laboratory services have been improved and plans have been laid for the production of vaccines, including those of heartwater, redwater, and rabies. The work of the Livestock Improvement Centres has also progressed and flocks and herds of indigenous stock of improved pattern are slowly being built up.

A start has also been made with the construction of a training centre for African personnel.

Such matters as the better housing of stock, the improved production of hides and skins, of ghee and butter, the mapping and maintenance of stock routes, the flow of slaughter stock to markets, a donkey importation scheme and the experimental application of power sprays for the control of ticks in African areas have all received attention.

It is recorded that in spite of all efforts, the supply of meat still remains inadequate for the increasing local demands. Proposals have been submitted for the reorganisation of the livestock and meat industry, including the erection of a central abattoir and cold store.

Diseases

Tick-borne diseases, especially heartwater and East Coast fever, continue to take a heavy toll, particularly in the Northern Province, which is largely outside the scope of the dipping scheme.

Trypanosomiasis is also a serious menace to livestock especially in the Lower River district. *T. vivax* is the parasite involved in all cattle cases and the clinical symptoms, which are of a mild nature, yield readily to injections of dimidium bromide. During the year 1,523 injections of the drug were given.

It is thought that mechanical transmission by means of flies other than tsetse play a considerable part in the spread of the disease, and to deal with this factor hexidole dipping fluid is used in the tanks in affected areas.

Although blackquarter and African horse sickness were of low incidence during the year, the usual precautionary vaccinations were continued.

Rabies continues to be a serious disease. During the year 44 cases in dogs, 13 in horses, one case in sheep and one in cats were recorded.

Fleury avianised virus vaccine is being widely used and with success in that no case has yet occurred in the vaccinated dogs. Arrangements have now been completed to produce the vaccine at the Department's laboratory.

A disease called three-day sickness is widely prevalent in the Southern Province during January and February and occurs almost entirely among European pure bred and grade cattle.

Sekobo disease (Streptothricosis) is being successfully treated with arsenic dipping solution.

Ringworm, helminthiasis and fascioliasis are all encountered; the last is a serious problem especially in the swampy areas. At the Blantyre and Limbe abattoirs some 47 per cent. of sheep livers were condemned for this condition during the year.

In poultry diseases, fowl typhoid, fowl pox, and coccidiosis have all been encountered and successfully dealt with—fowl typhoid by means of a live vaccine produced at the laboratory, and coccidiosis by the routine use of sulphamezathine, and sulphaquinoxaline, especially the latter. The expansion of the laboratory services under the supervision of the Senior Veterinary Research Officer has added greatly to the efficiency of the Department. Biochemical, histological, and bacteriological examinations are now carried out and a new method of staining Negri bodies has been evolved.

A cerebral disease entity clinically resembling heartwater but caused by *Babesia bigemina* has been investigated.

At the animal husbandry centres valuable work has been done in demonstrating better housing conditions for stock, fodder growing, ensilage making, hides and skins preparation, regular dosing of calves for worms, and castration of surplus and inferior bulls. The animal husbandry work of the Department is well demonstrated by the numerous good photographs which embellish the Report.

W. W. H.

BOOK REVIEWS

The Chemist's Veterinary Handbook (formerly Veterinary Counter Practice). Eleventh edition. The Chemist and Druggist, 1955. Price 27s. 6d.

This book is intended to assist the practising pharmacist in meeting the requirements of veterinary surgeons and the general public. It is technically inadequate for veterinary students and practitioners although it may well be useful to agricultural students. Its contents are, however, of interest to veterinary surgeons in indicating the approach of the pharmacist to this aspect of his responsibilities.

The book is not well balanced, some sections being very good, others most disappointing. Among the better features is a major section in which the important diseases of each of the domesticated animals are listed and systematically described. The lists are comprehensive and the descriptions, although somewhat cryptic, refer to aetiology, symptoms, treatment and prevention. There is naturally considerable emphasis on infectious diseases due to animal parasites, bacteria and viruses, but non-specific diseases, nutritional abnormalities and local infections and lesions are also discussed. The presentation is lucid, the lay-out facilitates rapid reference and the information is reasonably up-to-date.

In other sections of the book the presentation is out of date and irritatingly pedagogic. The horse is still considered as the most important species, and

items such as therapeutic bleeding are over emphasised. There are, moreover, two unnecessarily large sections devoted to lists of favoured prescriptions for non-specific remedies (condition powders, spring medicines, distemper pills, etc.). They unfortunately do not reflect advances in pharmacology, pharmacy or veterinary science, and are merely a rehash of traditional remedies many of which it would be difficult to justify pharmacologically. On the whole these prescriptions form an extravaganza in polypharmacy. Few contain less than six component drugs, many contain 10, and at least one contains 13 of which possibly two are active! Unjustified claims are made for many prescriptions and one general mixture is recommended for treating tympany, haematurea, diarrhoea, influenza, colic, mastitis and milk fever. In all some 50 pages are devoted to these traditional remedies, whereas the sulphonamides, antibiotics, vitamins and hormones are dismissed in three or four pages each.

Throughout the book information of general veterinary interest is given, e.g., tables of gestation periods, a list of common rodenticides and another of notifiable diseases, which may be useful occasionally to pharmacists. There are, however, a few sections which many veterinary surgeons will find difficulty in accepting as falling within the province of the pharmacist. These include discussions on lameness in the horse; the dentition of horses; dishorning of cattle; and general anaesthesia.

On some occasions the recommendations made for treatment of animals might prove dangerous if implemented by a non-veterinarian, for the work is not free from pharmacological inaccuracies and therapeutic mistakes. Few veterinary surgeons to-day, for example, would recommend that a respiratory infection in the horse be treated with a draught repeated every four hours (p. 105), or that all cases of colic may be treated with arecoline (p. 111). Nor would they accept without qualification, the view that cattle are good subjects for chloroform anaesthesia (p. 68).

In the view of the writer this book focuses attention on the desirability of defining more closely the position of the pharmacist under the Veterinary Surgeons Act, 1948.

Outdoor Pig Keeping by KEN BOLTON. Pig Publications Ltd. Price 5s.

The author describes his experiences of what proved to be a commercial proposition covering a period of six years. At the time of writing the herd consisted of 60 Wessex Saddleback sows and their offspring. These were kept entirely out of doors in as near natural surroundings as possible. Special forage crops—such as potatoes and cereals and special grass mixtures were grown for the pigs, which harvested the food themselves. Only a limited amount of meal (2½ lb. per head) was fed in the form of nuts on the ground to supplement these crops. Light rough shelters were provided at suitable points where the pigs could lie dry even in the worst weather. Farrowing was likely to take place in the hedges or any convenient spot selected by the sow and whilst privacy was provided in the form of Anderson shelters (for the first week after farrowing) no other accommodation was given.

None of the common troubles seem to have been encountered, such as breeding irregularities, infertility, indigestion, etc. The significance of this story lies in the fact that the author has first observed the habits of his pigs, and supplied their minimum needs subsequently with resulting success. His methods and comments are worth noting. N. S. Barron.

ABSTRACTS

Use of Phenylbutazone (Butazolidin) in the Treatment of Posterior Paralysis and Arthritis in Dogs. *J. Am. vet. med. Assoc.* **125.** 128-9.

Experimentally phenylbutazone (Butazolidin) has been shown to have strong analgesic and antipyretic properties, besides delaying and minimising local tissue reaction produced by chemical and physical irritants.

Clinical investigations in man have proved its usefulness in painful musculoskeletal conditions.

Satisfactory response to the drug has been obtained in about 30 dogs suffering from such conditions as intervertebral disc protrusion, painful fractures, arthritis, and painful injuries to limbs and joints.

The drug was administered orally in the form of 100 mg. tablets. Dosage depends on the condition to be treated and is gradually reduced when the desired response is attained, to avoid the possibility of toxicity. Toxicity has been reported in man but has not been observed in the dogs treated by the author.

Four case histories are reported which illustrate the possible usefulness of phenylbutazone in the canine. L. C. V.

Phenylbutazone (Butazolidin) is sold in this country by Pharmaceutical Laboratories Geigy Ltd., Manchester.

Anthrax and Bone-Meal Fertiliser. JAMIESON, W. M., & GREEN, D. M. (1955). *Lancet*, March 12th, 1955. 560-561.

This report describes six cases of anthrax in the human subject occurring in the Dundee district during the years 1952-54. Three of the patients were farm servants who had been engaged in distributing bone-meal as a fertiliser. One was a nurseryman and one (a mechanic) was an amateur gardener, both had been using bone meal as a fertiliser. The sixth was a dock labourer who had been unloading a cargo of crude bone-meal. One of the farm labourers died.

Anthrax bacilli were demonstrated in smears from five of the cases and the organisms were isolated in culture from four.

The bone-meal was known to have been imported from the Far East in three of the cases, and probably also in the other three. Anthrax bacilli were isolated from the bone-meal concerned in three of the cases.

The report concludes with an emphasis that bone-meal should be subjected to a process that would be adequate to destroy the spores and refers to risk to animals associated with imported animal products such as bone-meal. G. F. B.

News and Comment

DR. ZARKO DOLINAR

Those of our readers who have watched his brilliant play on their television screens may not know that Dr. Zarko Dolinar, men's doubles table tennis world champion is a veterinarian. He is an assistant in the Department of Anatomy (veterinary faculty) of the University of Zagreb, having graduated in

1948. Among his other titles Dr. Dolinar is singles champion of England, Scandinavia, Yugoslavia, and the Netherlands, and men's doubles and mixed doubles champion of Switzerland.

HOLIDAY EXCHANGE

There appear to be a number of French veterinary surgeons whose sons and daughters would like to spend part of their summer holidays with British veterinary surgeons and, in return, would like to entertain the British children in their homes.

The following is a list of places where there is a French veterinary family who would like to make this exchange, and any member of the profession who is interested is asked to write as soon as possible to the General Secretary of the B.V.A. for further particulars.

Loiret (Châteaux de la Loire Region): Boy of 13.

Drôme Region: Boy of 15 would like to visit England about July 10th and take back an English boy in August.

Drôme Region: Two girls, free on August 5th, would like to stay *au pair* with one family, or two families near to one another. The elder girl, who is 19, would teach children and help in the house; the younger, 18, would look after children and help in the house.

Yonne Region: Boy of 15.

Gers Region: Boy of 13.

Gers Region: Boy of 13.

Sarthe Region: Boy of 17 would like either to visit *au pair* or receive an English boy in exchange.

Vienne Region: Boy of 14. His mother would bring him and would return to France with an English boy.

Landes Region: A young man of 20, who has just finished a year specialising in mathematics. He would like to stay as a paying guest, but would take another boy to his home in exchange if desired. He would like to come to England from about July 15th to August 15th.

Seine et Oise Region: Boy of 17 living in Versailles.

Paris: Girl aged 14.

Spanish Veterinary Student: A 26-year-old veterinary (final year) student, Pedro Cangas, of Plaza Independencia No. 2, Madrid, wishes to work on a British farm for the summer months, offering his services in order to improve his English. Any reader who may be good enough to help or advise this young man is asked to write to him direct.

ROYAL VETERINARY COLLEGE ALUMNUS SOCIETY

In October, 1954, a steering committee was formed to undertake the preliminary work for the formation of an Alumnus Society which could play an important part in the life of the Royal Veterinary College. The committee hopes to organise an At Home at the College next autumn on the day of the Commemoration Ball, when the Society can be formally established, the officers elected, the constitution agreed and the fee for membership discussed.

Among suggestions made is one that a copy of *The Incisor*, containing an Old Students section will be sent to every member of the Society.

All former students of the College, together with past and present members of the academic staff, are eligible for membership. All graduates and members of the academic staff have been circularised. The response to date has been most encouraging but it is felt that many more people would wish to

join, and they are invited to write to Mr. J. C. Whitney in the Department of Pathology of the College.

A later notice will give details of the first meeting in November.

APPOINTMENT IN THE N.A.A.S.

Mr. P. J. Macfarlan, B.SC., N.D.A., N.D.D., Deputy Provincial Director for the Yorks & Lancs Province, has been appointed Director of Experimental Centres. The post, a newly created one, will be located at the headquarters of the N.A.A.S. in London.

Under the direction of the Senior Advisory Officers and in close association with the Experimental Husbandry and Experimental Horticulture Committees (and Sub-Committees) of the Agricultural Improvement Council, to which he will act as Convenor, the principal duty of the Director of Experimental Centres will be to supervise and control the experimental work at the Experimental Husbandry and Horticulture Centres. His duties will also include the general oversight and co-ordination of the field experimental work at provincial centres and in the counties, and responsibility for the collection, tabulation, examination and preparation for publication of the results of experiments.

BULL AND BOAR LICENSING ADVISORY COMMITTEE

After consultation with the Agricultural Improvement Council for England and Wales, the Minister of Agriculture, Fisheries and Food has appointed a committee to advise him on the administration and future development of bull and boar licensing in England and Wales. The commitee will be under the chairmanship of the Earl St. Aldwyn, T.D., D.L., Joint Parliamentary Secretary to the Ministry, and the other members are:—

Nominated by the Minister—Mr. E. G. E. Griffith; Dr. John Hammond, C.B.E., F.R.S., lately Director of the Animal Reproduction Unit, School of Agriculture, Cambridge; Dr. Alan Robertson, B.A., D.SC., of the Institute of Animal Genetics, University of Edinburgh; Professor H. G. Sanders, M.A., PH.D., Chief Scientific Adviser (Agriculture) to the Ministry of Agriculture, Fisheries and Food.

Nominated by the National Farmers' Union—Mr. R. J. Charlton; Mr. H. Shilleto; Mr. F. Vincent.

Nominated by the National Cattle Breeders' Association—Mr. E. C. J. Allday; Lt.-Col. E. C. Bowes; Mr. I. H. Lamb.

Nominated by the British Veterinary Association—Mr. S. L. Hignett, B.SC., M.R.C.V.S.

Nominated by the National Pig Breeders' Association—Mr. W. Bellerby; Mr. H. Harding.

Nominated by the Milk Marketing Board—Dr. Joseph Edwards.

The following have been appointed Assessors to the committee:—

Mr. J. N. Ritchie, B.SC., M.R.C.V.S., D.V.S.M., Chief Veterinary Officer; Mr. H. E. Bannister; Mr. W. P. Dodgson.

The Secretary of the committee is Mr. G. R. Woodward, Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S.W.1.

PERSONAL

Births

GREEN.—On March 20th, 1955, to Joan (*née* Marshall), wife of W. Clifton Green, B.SC., M.R.C.V.S., a daughter, Susan Carol.

MACALLISTER.—On April 3rd, 1955, at Clenoch Maternity Hospital, Stranraer, to Fay, wife of Donald I. Macallister, M.R.C.V.S., D.V.S.M., Broadstone, Stranraer, a son.

TYRRELL.—On April 6th, 1955, at Somerleigh Court, Dorchester, to Mary (*née* Adcock), wife of Kenneth M. Tyrrell, B.A., B.SC. (VET.), M.R.C.V.S., a son, Hugh Roderick Moore.

Engagement

SUTHERLAND—STAPLIN.—The engagement is announced between Duncan James Bruce Sutherland, M.R.C.V.S., youngest son of Mrs. Sutherland and the late Alex Sutherland, Duke Street, Golspie, Sutherland, Scotland, and Joyce Rosemary (Jill) Staplin, only daughter of Mr. and Mrs. C. R. Staplin, 34, Chandos Avenue, London, N.20.

R.C.V.S. OBITUARY

MACLEOD, Murdo, of Millcraig Cottage, Alness, Ross-shire. Graduated Edinburgh, December 13th, 1935. Died April 4th, 1955.

COMING EVENTS

April

20th (Wed.). Meeting of the Royal Society of Medicine, Section of Comparative Medicine, at the Society's house, 5 p.m.

21st (Thurs.). General Meeting of the Herts & Beds Division, B.V.A., at 70, Holywell Hill, St. Albans, 7.30 p.m.

22nd (Fri.). General Meeting of the Mid-West Division, B.V.A., at the Berkeley Café, Clifton, 2.30 p.m.

23rd & 24th (Sat. & Sun.). Annual Reunion Weekend for 1952 R.V.C. graduates and contemporaries. Dinner at " Ye Miller of Mansfield " Hotel, Goring, Saturday, 7.30 p.m.

28th (Thurs.). Meeting of the Essex Division, B.V.A., at the Essex Institute of Agriculture, Writtle, 7.30 p.m.

Ordinary General Meeting of the South-Eastern Division, B.V.A., at the Royal Star Hotel, Maidstone, 6.30 p.m.

30th (Sat.). Annual General Meeting of the Association of State Veterinary Officers in the Auditorium of the Wellcome Research Institute, 183-193, Euston Road, N.W.1, 1.30 pm. Annual Dinner at the Criterion Restaurant, Piccadilly, W.1, 7 p.m.

May

3rd (Tues.). Afternoon Meeting of the Eastern Counties Division, B.V.A., at Colchester.

6th (Fri.). Royal Veterinary College 163rd Annual Ball at the Hyde Park Hotel.

11th (Wed.). Evening Meeting of the Eastern Counties Division, B.V.A., at Ipswich.

Meeting of the Royal Veterinary College Medical Association at Streatley House, Berks, 2 p.m.

12th (Thurs.). R.C.V.S. Dinner, Dorchester Hotel. Further details will be published next week.

13th (Fri.). Annual Dinner-Dance of the Chiron Club in the Royal Hotel, Bristol, 7 p.m.

14th (Sat.). Annual Sports Day of the Royal Veterinary College to be held at Streatley, 2 p.m.

June

10th (Fri.). Annual Dinner of the R.A.V.C. Officers' Club, at Grosvenor House, Park Lane, London.

September

4th to 10th. 73rd Annual General Meeting and Congress of the British Veterinary Association at Belfast.

R.C.V.S. EXAMINATIONS

May 6th, Friday.—Pharmacology, etc., Examination (Revised Syllabus). Written Examination.

May 9th, Monday.—Pharmacology, etc., Examination (Revised Syllabus). Oral and Practicals (London and Dublin).

May 12th, Thursday.—Animal Management Examination at Dublin.

May 12th, Thursday.—Entries for D.V.S.M., Examination due.

June 9th, Thursday.—D.V.S.M., Written Examinations commence at Edinburgh.

June 13th, Monday.—D.V.S.M. Oral and Practicals commence.

June 23rd, Thursday.—M.R.C.V.S., Written Examinations.

June 24th, Friday.—M.R.C.V.S., Written Examinations.

June 27th, Monday.—M.R.C.V.S., Practical and Orals commence (Panels "A" and "B").

ADDRESSES OF DISEASE-INFECTED PREMISES

The list given below indicates, first, the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Swine Fever

Ayr. East Ashyard Farm, Galston (Apr. 5).

Bucks. Loughton Manor Farm, Loughton, Bletchley (Apr. 6).

Ches. Stoak Farm, Stoak, Chester (Apr. 5); Bank House Farm, Kelsall, Chester (Apr. 7).

Essex. Brick Kiln Farm, Kelvedon, Colchester (Apr. 5).

Flints. Bryn Owen, Iscoyd, Nr. Whitchurch, Salop; Bryntirion Gardens, Highfield Park, Rhyl (Apr. 6).

Gloucs. Cross Hands Farm, Chipping Campden (Apr. 5).

Lancs. New Farm, Glazebrook, Cadisbrook, Manchester (Apr. 5); Holton Road Piggeries, Skirton, Lancaster (Apr. 6).

Norfolk. Fruit Farm, Buxton Lamas, Norwich; Hall Farm, Snettisham, King's Lynn (Apr. 6).

Notts. Debdhill Farm, Misterton (Apr. 7).

Salop. Upper Wyke Farm, Shifnal (Apr. 5); Lubstree Park, Donnington, Wellington (Apr. 7).

Worcs. Bale Mill, Grimley, Worcester; 4, Finstal Road, Aston Fields and Upper Gambols Farm, Stoke Prior, Bromsgrove (Apr. 6).

Yorks. Lund House, Green Farm, Pannel, Harrogate (Apr. 7).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SNOW-SHOES FOR HORSES

Sir,—Your annotation on snow-shoes for horses is of considerable interest. It may be worth mentioning that these aids to progress have been used in this country quite recently.

Considerable experimental work was done in the Highlands among the animals of loch transport companies and the mountain artillery during 1941 and 1942 and a satisfactory shoe for mules and light horses was evolved.

This consisted of a cane circle suspended on chains from a boot strapped over the hoof. It was light, easily adjusted, quickly fitted or removed, and proved quite durable on test.

The annals of the R.A.V.C. should provide further information as much of the work was done by the various unit veterinary officers.

Yours faithfully,

P. K. HALL-PATCH.

Highlands,
Dibden Purlieu,
Southampton.

March 30th, 1955.

PREGNANCY TOXAEMIA

Sir,—In view of the recent correspondence in your columns on pregnancy toxaemia of ewes and Mr. Toovey's request for information, it may be of interest to give some preliminary details of work which is in progress here with the support of the Nuffield Foundation. The investigation is still in its preliminary stages and the application of the results to our understanding of the natural disease and to the practical management of in-lamb ewes must be considered as being purely tentative at present.

It is only possible to touch on a few aspects of this complex subject in a letter and my remarks will be confined to the syndrome of dietetic toxaemia of late pregnancy, *i.e.*, to the syndrome clearly related to an abrupt change in the total food intake in the last six to eight weeks of pregnancy.

In 1942 my Australian colleagues, Dr. M. C. Franklin and Mr. I. L. Johnstone, and I were successful in inducing this syndrome under field conditions in about 100 of a group of 500 merino ewes by subjecting them to a sudden and severe restriction of food intake in the last month of pregnancy (Parry, 1950). Further observation of natural cases in Britain suggested that, in addition to the change in food intake, another critical factor was *the amount of weight gain made by the ewes during early pregnancy*.

We have been able to confirm the importance of both these factors by inducing the syndrome under experimental conditions here, to show that the experimental syndrome is identical with the naturally occurring disease, and to make a number of observations on the pathological physiology underlying the clinical signs which suggest that the functional disturbance is much more complex than a simple ketosis (Parry, 1954; Parry & Taylor, 1955). Our results suggest that polytocous ewes, *i.e.*, ewes carrying more than one lamb, which become fat during the first three months of pregnancy are almost certainly less able to withstand a falling or abrupt change in their plane of nutrition or other stress during the last two months of pregnancy than are ewes which have not made such large weight gains.

To prevent the disease, the lambing flock should, after the pre-tupping flush, be kept in store condition with little or no gain in weight for about the first 100 days of gestation. The ewes are then kept on a gradually rising plane of nutrition—as far as possible without any check in their weight gain or general nutriture—until they lamb (Parry, 1953). The precise details of the feeding and management necessary to ensure this regimen vary from flock to flock and farm to farm. It is quite impracticable to lay down any hard and fast rules, but as a rough guide it is usually wise to begin feeding concentrates about eight weeks before lambing for winter lambing flocks and to increase the amount from, say, ¼ lb. per head per day gradually to 1 lb. to 2 lb. by lambing time, although, if the grazing or arable fold crops are of very poor quality, I understand 3 lb. of concentrates may be necessary.

We are at present assessing the implementation of these ideas in practice in some 70 lowland flocks with between 6,000 and 7,000 breeding ewes in various parts of Britain, half being pedigree flocks and half commercial. We hope to carry on the investigation for at least five years to take into account the well known natural fluctuations in the incidence of the disease from year to year, but the results to date are encouraging and suggest that it may be possible to reduce losses from this cause very materially. In many of these flocks the mortality rate for pregnancy toxaemia is now about 1 per cent. per annum, and where the disease occurs we have so far invariably had a history of a departure from the regimen outlined above, whether it be some problem of management affecting the whole flock or some concurrent disability affecting one or two individual sheep (Parry, 1955).

The treatment of the disorder still remains far from satisfactory and one hears of many conflicting reports as to the efficacy of various therapeutic measures. I suspect that this may be explained by the great variability in the natural course of the disease and the difficulty in assessing the severity and outcome in any individual case by ordinary clinical examination. I have recently had occasion to try out a new form of therapy, which seemed from our studies to be worth a preliminary clinical trial. A small series of consecutive cases were treated as they occurred in a flock, the odd numbers receiving the drug and the even numbers a similar preparation but without the drug. All the sheep have recovered and have lambed normally with a high proportion of normal viable lambs. The owner is delighted, but was the drug responsible in any way for this fortunate outcome?

Yours faithfully,

H. B. PARRY,

Nuffield Institute for Medical Research,
University of Oxford.

March 30th, 1955.

References

PARRY, H. B. (1950). *Toxaemias of Pregnancy; human and veterinary*. Edited by J. Hammond, F. J. Browne & G. E. W. Wolstenholme. A Ciba Foundation Symposium. 85-92.
———. (1953). *Suffolk Sheep Soc. Yrbk.*, 26-34.
———. (1954). *J. Physiol.* **126,** 40*P*.
——— & TAYLOR, W. H. (1955). *Ibid.* **127,** in Press.
———. (1955). *Proc. Brit. Soc. Anim. Prod.* In Press.
TOOVEY, J. A. (1955). *Vet. Rec.* **67,** 248. (March 26).

Sir,—I have read with interest the letters from Mr. Pickering and Mr. Toovey regarding pregnancy toxaemia and have a sympathetic understanding of Mr. Toovey's plea for guidance on the feeding of the pregnant ewe. I cannot, however, agree with Mr. Pickering's hypothesis that pregnancy toxaemia is due entirely to a protein deficiency.

Numerous researches, particularly by German workers, have shown the sheep's partial independence of pre-formed protein in its food owing to protein-synthesis by bacteria in the rumen. When a student at college I used to spend the Easter vacation each year, acting as a lamber in many hill flocks of Blackface sheep, and though their diet was grossly deficient in protein by text-book standards, I very rarely encountered a case of pregnancy toxaemia. I have, however, seen many cases in lowground sheep on a diet above reproach.

My own opinion, and here as a layman I must tread warily, is that, any sudden change in environmental conditions which is likely to alter the sheep's metabolism, such as severe weather, change

of food etc., seems to act as a trigger mechanism and precipitate the disease. In this connection it is of interest that a veterinarian who had a large cattle practice, once told me that a sudden lowering in the atmospheric temperature always kept him busy with cases of acetonaemia.

Yours faithfully,

STEWART MACFARLANE,

Englewood,
Kilmacolm,
Renfrewshire.

March 30th, 1955.

SCHEME FOR ANIMAL NURSES

Sir,—During the past few weeks I have had the opportunity of discussing with many veterinary surgeons at Divisional meetings, and in private, the suggested scheme for animal nurses.

It is quite apparent that there is considerable opposition to, and distrust of, the scheme amongst veterinary surgeons engaged in general practice. This fact should be made obvious to the B.V.A. Council when reports by the Divisional representatives are given.

At some Divisional meetings only the presence of salaried veterinary surgeons, *i.e.*, those not engaged in general practice, has prevented the sending in of a resolution condemning the scheme. These gentlemen, who, of course, are quite entitled to vote, have invariably voted for the scheme—it is unlikely that it will have any effect on them.

Unfortunately the class of veterinary surgeon most likely to be affected by the graduation and employment of the animal nurses, is the young man now engaged as an assistant. He is not able to attend Divisional meetings and his opinion is not sought. Those to whom I have spoken have all condemned the scheme.

Before it is too late, I suggest that the Society of Practising Veterinary Surgeons should call meetings in various parts of the country to discuss the scheme, and I am sure that the majority of such meetings would condemn it. I trust the Council of the B.V.A. will heed the voice of the general practitioner and advise the R.C.V.S. to proceed no further with the scheme.

Yours faithfully,

G. R. BENBOW,

2, Carlton Street,
Welford Road,
Leicester.

March 31st, 1955.

THE REGISTER OF VETERINARY SURGEONS

Sir,—I am rather surprised that there has not been more comment regarding the removal of so many names, including some well known ones, from the Register of the R.C.V.S.

The graduate is required to pay a registration fee to obtain the Diploma in recognition of his proficiency in the art and science of his profession. Thereafter the annual fee should surely be regarded as payment of a licence to practice, and not as a fee to retain the Diploma, which he has already earned.

Inevitably there is a certain stigma associated in our minds with removal of names from the Register. It seems rather shabby treatment of our elder brethren, who have borne the heat and toil of the day, to be thus disowned by the profession, of which they may have been for many years good and faithful servants.

On looking up old reports, I find that 70 years ago the R.C.V.S. was criticised as being out of touch with the feelings of the general body of the profession. Such criticism would appear to be equally true to-day. The baffling so-called "ethical code" is another example.

One of the principal duties of the R.C.V.S. is to administer professional justice, but also there must surely be a moral responsibilty to make it manifest to all that justice is in fact being done. A more human approach to everyday problems, better public relations, and some explanation of the reasons for certain decisions, would be generally appreciated.

Yours faithfully,

R. I. MACRAE,

83, Grantham Road,
Sleaford,
Lincs.

April 10th, 1955.

Sir,—Though the above subject matter was classified as a general article in your issue of March 3rd, it purports to be a legal public notice.

Under colour of law we are informed that names of 84 persons have been removed from the Register of Veterinary Surgeons. Sir, I raise strong objection against the apparently incompetent and arbitrary manner in which this statutory duty has been performed.

Let it be borne in mind that the Council and Office-bearers of the Royal College of Veterinary Surgeons are not only servants of the veterinary profession but of the general public also. As serving representatives of a Royal College the Council and Office-bearers owe a particular fealty to the Sovereign; as a quasi-judicial body they owe a duty strictly to observe the law and the rules of legal procedure. Such is in accordance with ancient usage in this realm. Thus it follows that acts performed by the Council and Office-bearers of the Royal College of Veterinary Surgeons in the name of the veterinary profession and/or the public, become the responsibility of those whom they represent. Be the result good or bad the precedent once established must stand to the credit or discredit of the general body of the profession.

If the public notice as printed be a true copy of the legal notice submitted for publication—and I have no reason to believe otherwise—then the personal duty of the electors is clear.

To my mind the notice as printed lies fully exposed to challenge. I am of the opinion that it is very

questionable whether it has any force or effect in law. To the best of my knowledge, and with regard to publication of the enforcement of any statutory instrument, unless an Act or other ordinance makes specific provision *re* publication, the rules of legal procedure shall be recognised. In the rules of legal procedure it is laid down, in effect; that before a statutory notice can have full force and effect it must show legal authority by reciting appropriate reference to the Veterinary Surgeons Act, 1881 and other statutory instruments. This was done. Such notice must also show the date upon which the enforcement will come into effect, and this was *not* done. Furthermore, such a notice should carry the signature and designation of the authority which is empowered to enforce the enactment, and this also has *not* been done.

To my mind these important omissions cause the notice to lose all force and effect not only in Scotland but maybe in England.

Again, bearing in mind that no provision appears to have been made in any of the Ordinances pertaining to Registration of Veterinary Surgeons in the instance of resignation, I feel that since resignation (as opposed to removal for other causes) is an honourable course the distinction drawn should have been made much more clear than it was and that two separate lists should have been printed.

By the Veterinary Surgeons Act, 1881, the Register of the Royal College of Veterinary Surgeons became statutory. In the designation of persons in the Register all lawful titles, honours, decorations, university degrees and appointments have been admitted, and form part of the designation—and rightly so. Admitted that for the purposes of removal the Act makes reference to name and name only. Inconsistency is evident here; the inconsistency stands at variance with other authorities and leads me to believe that when a person's name is removed from the Register, the designation of the person should be a true copy of the designation as it appeared in the Register, veterinary qualifications excepted. Should the form in which the notice has been made be upheld, then designations as they now appear in the Register can no longer have place in it, and this I would deplore.

According to the Register, 32 of the 84 names listed are identifiable with persons who were gazetted out of H.M. armed forces with authority to use military titles of rank. From the same source we learn that several names have been listed which are identifiable with persons who have received from the hands of the Sovereign distinguished honours, and/or distinguished decorations; *viz*, C.M.G. (1); C.B.E. (1); O.B.E. (5); D.S.O. (4); A.F.C. (1); T.D. (2). Again, amongst the names removed are several who are graduates of universities.

I put it to the person or persons immediately concerned that in removal of a name from the Register there is no authority whatever to exclude from the public notice of the enforcement any title, honour, decoration, or university degree which properly belong.

With regard to aged and non-practising members of the profession I join with Dr. Hare and others who are like-minded that the case of many of these gentlemen be reconsidered.

Let us not forget that many of them are now in advanced old age, probably infirm and perhaps impoverished. In the terms of service they are in the main "the fathers of the profession," who in the days of their strength carried the torch of service through the darkest days the profession has known. Again, in our considerations let us remember that the spirit of the dead past, however unseen, moves inexorably through the living present to influence the unborn future. Precedent to-day gives us a name; to-morrow decree may recognise us by a number only.

Sir, Portia is made to say:—

> "It must not be; there is no power in Venice
> Can alter a decree so established;
> 'Twill be recorded as a precedent,
> and many an error by the same example
> Will rush into the state; it cannot be."

What sayest thou?

Yours faithfully,

GEORGE DYKES,

100, Bothwell Street,
Glasgow, C.2.

April 7th, 1955.

VIS USED-TO-BE FORTIOR

Sir,—Up to and including the year 1949 the title page, duplicated on the cover, of the Register of Veterinary Surgeons displayed the armorial bearings, crest and motto of the Royal College of Veterinary Surgeons. On the title page and cover of the Register of Veterinary Surgeons and the Supplementary Veterinary Register, 1950 and following years, the arms have been replaced by a blotchy, illegible miniature device of the Royal Arms, which appears on the publications of Her Majesty's Privy Council through Her Majesty's Stationery Office.

By-law 133 (b) states that the money arising from the annual fee, which is paid by members of the Royal College, shall be applied "in payment of the cost of printing and publishing the Register of Veterinary Surgeons and of distributing the same to members in accordance with Section 2 (i) of the Act" [*i.e.*, the Veterinary Surgeons Act, 1881, Amendment Act, 1920]. This by-law does not appear to have been rescinded or amended by subsequent legislation. The current Register is still published by the Royal College, and distributed to, and at the expense of, the annual fee payers.

Why, and upon whose authority, were the arms of the Royal College replaced by the Royal Arms? Were the annual fee payers consulted and do they approve?

Yours faithfully,

TOM HARE,

529A, Finchley Road,
London, N.W.3.

March 30th, 1955.